

**FINAL**

***DECISION DOCUMENT FOR  
INTERIM REMEDIAL ACTION  
AT RSA-13,  
OPEN BURN/OPEN DETONATION  
AREA, REDSTONE ARSENAL***

**EPA ID NO. AL2 210 020 742  
APRIL 1995**

**U.S. ARMY CORPS OF ENGINEERS  
SAVANNAH DISTRICT**

## ***ABBREVIATIONS AND ACRONYMS***

ADEM	Alabama Department of Environmental Management
AR	Army Regulation
BNA	Base/Neutral/Acid Extractables
CERCLA	Comprehensive Environmental Response and Compensation Liability Act
CRP	Community Relations Program
DA	Department of the Army
DOD	Department of Defense
FFA	Federal Facilities Agreement
EPA	US Environmental Protection Agency
HEA	Health and Environmental Assessment
ICM	Interim Corrective Measure
IRA	Interim Remedial Action
MICOM	U.S. Army Missile Command
NCP	National Contingency Plan (National Oil and Hazardous Substances Pollution Contingency Plan)
NOV	Notice of Violation
OB/OD	Open Burn/Open Detonation
PIRP	Public Involvement and Response Plan
RCRA	Resource Conservation and Recovery Act
RSA	Redstone Arsenal
RFI	RCRA Facility Investigation
SARA	Superfund Amendments and Reauthorization Act
TCE	Trichloroethylene or Trichloroethene
TRC	Technical Review Committee
TSS	Total Suspended Solids
TVA	Tennessee Valley Authority
UV	Ultraviolet
VOC	Volatile Organic Compound

**DECISION DOCUMENT**  
***FOR INTERIM REMEDIAL ACTION AT RSA-13,  
OPEN BURN/OPEN DETONATION AREA, REDSTONE ARSENAL***

**PURPOSE OF INTERIM REMEDIAL ACTION**

This decision document describes the selected interim remedial action for RSA-13, Open Burn/Open Detonation (OB/OD) Area, (see Figure 1-3), at Redstone Arsenal developed in accordance with the CERCLA as amended by SARA, the NCP, RCRA, and AR 200-1, as applicable. RSA-13, Unit 2, is approximately 89 acres in size and is located in the southern part of Redstone Arsenal near the Tennessee River.

The OB/OD areas are used to dispose and decontaminate explosives and explosive-contaminated materials and to dispose of reactive wastes by thermal treatment. The reactive wastes include bulk propellants, propellant-contaminated solvents, and nonhazardous propellant-contaminated waste such as rags and wood containing 4% or less propellant. Prior to January 1986, solvents and solvent-contaminated materials were routinely incinerated directly on the ground at two open burn pads of the Open Burn Area in the northern portion of RSA-13.

In January 1986, Redstone Arsenal received a Notice of Violation (NOV) from the Alabama Department of Environmental Management (ADEM) following an inspection in June 1985 of the Unit 2, RSA-13, burning area. During the inspection, ADEM observed that solvent burning on unprotected ground was being conducted at Unit 2, RSA-13. As a result, ADEM recommended the installation of groundwater quality monitor wells in the overburden and bedrock at the site to determine whether subsurface contamination may have occurred, and if so, to what extent.

In response to the NOV, Redstone Arsenal conducted a RCRA Facility Investigation (RFI), in two phases, to assess site subsurface conditions and to determine what impacts, if any, the prior site activities may have had. Volatile organic compounds (VOCs), base/neutral/acid extractables (BNAs), and metals were detected at varying concentrations, some above regulatory action levels, in soils and groundwater underlying the site. The bulk of solvent contamination is Trichloroethylene (TCE). Figure 2-1 shows the TCE contamination contours in the Upper Bedrock as generated based on RFI data.

A Health and Environmental Assessment (HEA) was performed in conjunction with the RFI activities. The purpose of the HEA is to determine possible human and environmental exposure routes so as to assess potential contaminant routes of migration. During the conduct of the HEA, VOC's and BNAs and explosives, to a lesser degree, were found to be present at concentrations exceeding systemic and/or carcinogenic criteria. The carcinogenic criteria were exceeded by a factor ranging from 1.75 to 971. However, based on the exposure pathway analysis, it was determined that the probability of exposure to contaminants by either hunters or RSA personnel was low. As result of the NOV received from ADEM and the contaminant levels encountered during the RFI, Interim Corrective Measures (ICMs), as outlined herein, have been designed and are planned for the site.

This decision document was developed by the MICOM Environmental Office, Redstone Arsenal, with support from the U.S.Army Corps of Engineers. The selection remedy outlined herein has concurrence from the United States Environmental Protection Agency (EPA) and Alabama Department of Environmental Management (ADEM).

## SUMMARY OF SITE RISK

Health and Environmental Assessment (HEA) were performed during Phases I & II of the RCRA Facility Investigation at RSA-13, OB/OD Area. The HEA was done to determine the possible human and environmental exposure routes; to identify and evaluate the potential contaminant routes of migration.

## SUMMARY OF REMEDIAL ALTERNATIVES

The Interim Corrective Measure (ICM) for RSA-13 consists of a distribution network of a maximum of eighteen (18) extraction wells screened into both the upper limestone and the coarse grain alluvium that appears at some locations above the limestone, see Plate C-2. All piping, cable, and control wires are buried below grade. The potential for ejected debris from open detonation precludes the use of surface-run pipe and cable systems.

The ICM design includes the requirement for use of Advanced UV Oxidation to destroy the contaminant(s). Analysis of site groundwater indicates the need for a pretreatment system in order for UV Oxidation to be fully effective. The design allows for pretreatment system for iron oxidation and TSS removal as well as sludge dewatering. The iron oxidation will be carried out by hydrogen peroxide addition. The iron and TSS removal will be accomplished by addition of polymer, flocculation, settling and filtration. Sludge dewatering will be achieved by filtering through automatic backwashing bag filters.

The treated effluent will flow through a six inch PVC pipe and discharge through an outfall into a small stream draining westward into Wheeler Lake and the Tennessee River.

The options considered for treatment of the groundwater to remove chlorinated organic compounds were: air stripping, granular activated carbon, advanced oxidation processes, and biological treatment. An economic evaluation was performed to establish the most cost effective treatment system based on a full service contract provided by the contractor over the anticipated life of the treatment program. The treatment option evaluated were:

- Option 1: Advanced Oxidation Process
- Option 2: Liquid Phase Carbon Adsorption Process
- Option 3: Air Stripping
- Option 4: Air Stripping with Liquid Phase Carbon Adsorption
- Option 5: Air Stripping with Catalytic Oxidation in the Vapor Phase
- Option 6: Air Stripping with Vapor and Liquid Phase Carbon Adsorption

#### TREATMENT OPTIONS

	1	2	3	4	5	6
Set-Up	\$5,500	\$ 75,000	\$30,000	\$54,000	\$105,000	\$105,000
Monthly Service	\$7,800	\$ 5,500	\$ 3,500	\$ 4,900	\$ 10,000	\$ 9,000
Monthly Power	\$3,582	\$ 150	\$ 400	\$ 470	\$ 1,100	\$ 600
Annual Cost Carbon	\$ 0	\$348,000	\$ 0	\$ 3,400	\$ 0	\$ 88,000
Purchase Air Stripping	\$ 0	\$ 0	\$55,000	\$ 55,000	\$ 55,000	\$ 55,000
Purchase Incinerator	\$ 0	\$ 0	\$ 0	\$ 0	\$150,000	\$ 0
Annual Cost	\$139,350	\$453,300	\$89,300	\$122,340	\$288,200	\$283,200

Option 1 was selected for implementation because of low cost and several technical advantages over the other options. The technical advantages are:

- \* Permitting of the effluent is less time intensive and expensive.
- \* Process is least sensitive to changes in contaminant loading
- \* Maintenance costs are expected to be the lowest.
- \* Air dispersion modeling not required by this option.

One of the key considerations of the advanced UV process and a primary reason for its selection is that numerous types of contaminants can be readily destroyed through photooxidation to carbon dioxide, water, and inorganic salts.

## PUBLIC/COMMUNITY INVOLVEMENT

It is the policy of the Department of Defense (DOD) and the Department of the Army (DA) to involve the general public including the local community as early as possible and throughout the installation restoration process at an installation. To accomplish this, a Community Relations Plan (CRP) was developed at Redstone Arsenal with input from residents and officials from the local communities. The CRP document is the guidance document that, under the Federal Facilities Agreement (FFA), will be followed to conduct community relations activities at this installation. As a subplan to the CRP, the site or project specific Public Involvement Response Plan (PIRP) describes the mechanisms in place to provide the public with the information about the specific activities on-going and planned for RSA-13. A Technical Review Committee (TRC), designed to disseminate information to the general public regarding planned or proposed remedial actions for specific sites, has been established in response to CERCLA and NCP requirements. The committee, which meets approximately every three months at RSA, has been kept up-to-date regarding the status of RSA-13 planned activities. In addition, two fact sheets outlining on-going and planned activities at RSA-13 have been prepared and distributed to general public.

## DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate to this interim remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies that employ treatment that reduces the volume of toxic material as a principal element.

Because this remedy is a source removal and will only address 60% of the groundwater contamination further remedial action will be required to address groundwater and soil contamination. The five-year review will not apply to this interim remedial action. This remedy will be consistent with future remedies needed to address groundwater contamination at this location.

### PREPARED UNDER DIRECTION OF:

\_\_\_\_\_  
M. Whitt Walker  
Environmental Engineer,  
Environmental Management and Planning

DATE: \_\_\_\_\_

### REVIEW BY:

\_\_\_\_\_  
H. Sam Fields  
MICOM Environmental Officer

DATE: \_\_\_\_\_

### APPROVED BY:

\_\_\_\_\_  
Stephen P. Moeller  
Col., AD  
Commander, RASA

DATE: \_\_\_\_\_



# ***FIGURES***

## **LIST OF FIGURES**

Figure 1-3	RSA-13-Open Burn/Open Detonation Area
Figure 2-1	TCE Contamination-Upper Bedrock
Figure C-2	Site Arrangement Plate
Figure 3-1	WTS Building Equipment Layout Plan

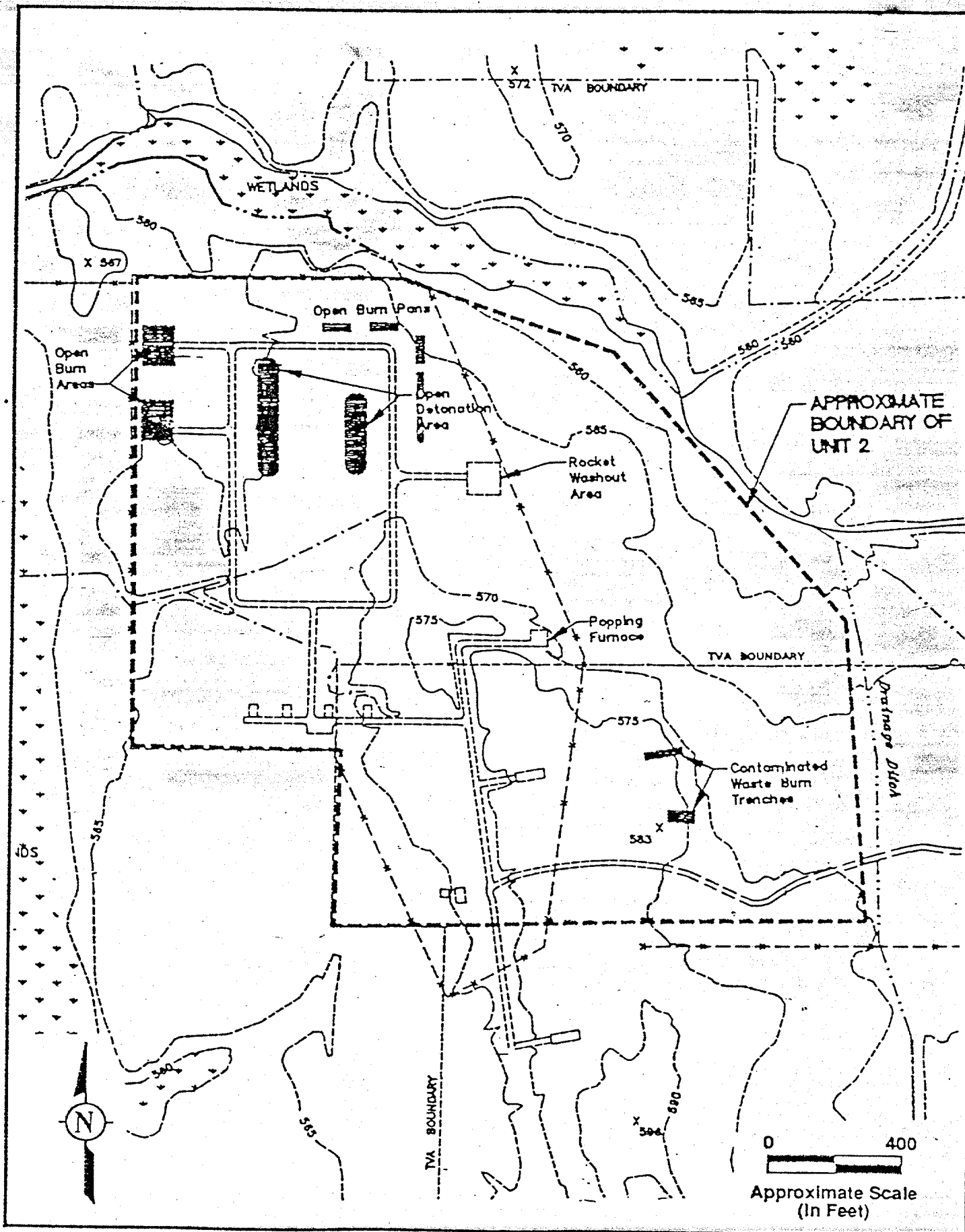
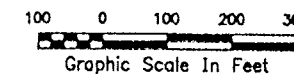
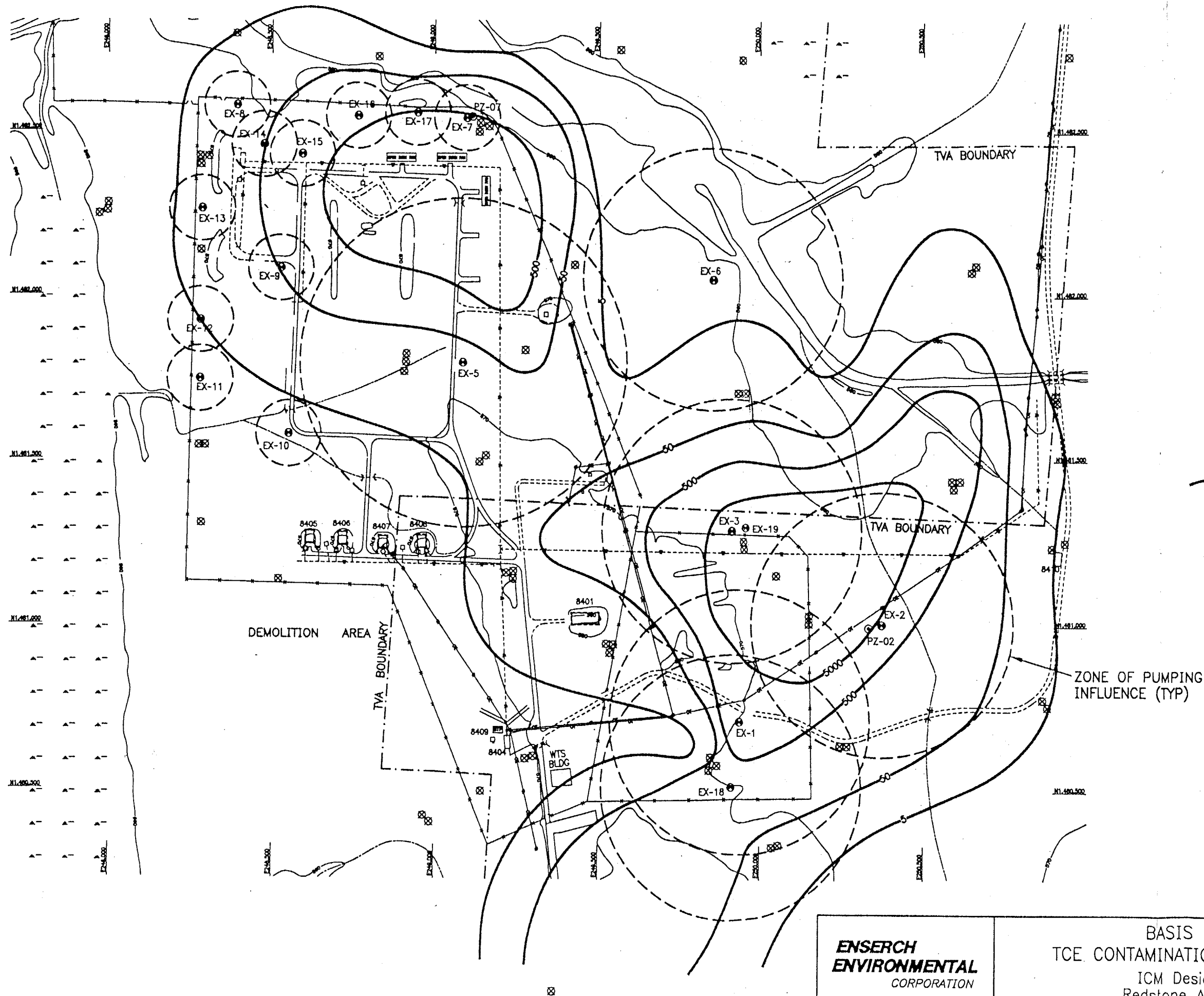


FIGURE 1-3 UNIT 2 - OPEN BURN/ OPEN DETONATION AREA



# LEGEND

- 500 — TCE CONCENTRATION IN PPB
- EXTRACTION WELL LOCATION
- PIEZOMETER LOCATION
- ⊗ EXISTING MONITORING WELL

**ENSERCH**  
**ENVIRONMENTAL**  
CORPORATION

BASIS OF DESIGN  
TCE CONTAMINATION - UPPER BEDROCK  
ICM Design At RSA-13  
Redstone Arsenal, Alabama

Figure  
2-1



5

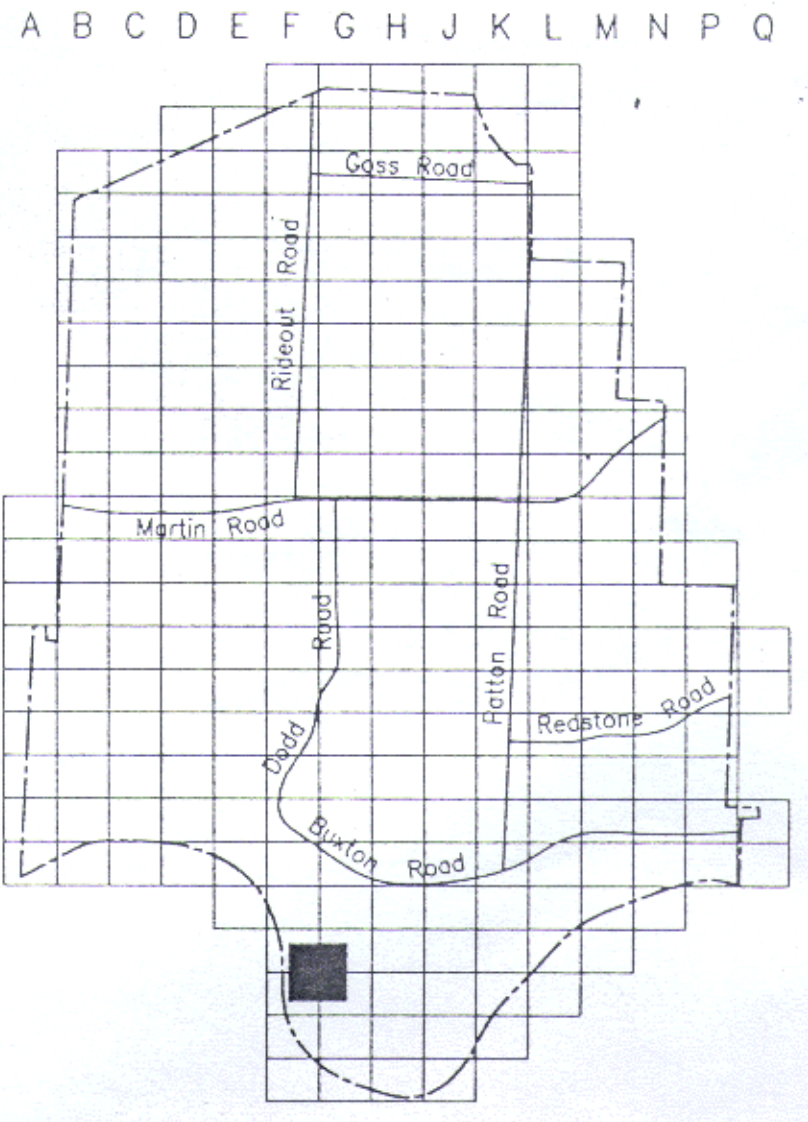
4

3

2

1

KEY MAP



NOTES

1. THE CONTRACTOR SHALL MAINTAIN AND REPAIR EXISTING ROADWAYS, WITH LIKE MATERIAL, WITHIN THE LIMITS OF WORK DURING CONSTRUCTION AND UPON COMPLETION OF WORK TO PRECONSTRUCTION CONDITIONS TO FACILITATE NORMAL TRAFFIC PATTERNS.
2. CLASS 1 RIPRAP AS DEFINED IN SECTION 814 OF THE ALABAMA HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS, 1992 EDITION SHALL BE PLACED TO A MINIMUM DEPTH OF 18 INCHES IN ACCORDANCE WITH SECTION 610 OF THE SAME SPECIFICATIONS.
3. EFFLUENT PIPING (PVC) CARRYING TREATED WATER WILL BE CONTAINED IN STEEL CASINGS UNDER EXISTING OR PROPOSED ROADWAYS.
4. NINE WELLS, EX-1 THRU EX-10 (EXCEPT EX-4) ARE INSTALLED AND READY FOR FINAL PLUMBING DETAILS BY THE CONTRACTOR. WELLS EX-11 THRU EX-19 ARE TO BE INSTALLED AS DIRECTED BY THE CONTRACTING OFFICER, IN ACCORDANCE WITH THE SPECIFICATIONS.
5. FLOW RATES FROM WELLS WILL BE DETERMINED BASED ON CONTRACTOR PROVIDED PUMPING TESTS, IN ACCORDANCE WITH THE SPECIFICATIONS.
6. THE SURVEY REFERENCE COORDINATE POINT TABLE CONTAINS POINTS INTENDED FOR THE CONTRACTOR'S USE IN HORIZONTAL CONTROL. THESE POINTS WERE ESTABLISHED FROM DIGITIZED CAD DRAWINGS.
7. WATER LINE TAP INTO EXISTING 3" CIP WILL BE ACCOMPLISHED BY THE GOVERNMENT.
8. PROPOSED WATER LINE VALVES AT TIE-IN TO EXISTING 3" CIP AND OUTSIDE OF WTS BUILDING WILL INCLUDE VALVES, VALVE BOXES, AND ALL NECESSARY APPURTENANCES.

SURVEY REFERENCE COORDINATE POINTS

POINT NUMBER	NORTH	EAST
1	1480.5	249.924
2	1480.7	249.975
3	1480.7	249.944
4	1480.7	249.990
5	1481.0	250.334
6	1481.0	250.362
7	1481.0	249.535
8	1481.4	249.793
9	1481.3	249.910
10	1481.3	249.946
11	1482.0	249.836
12	1482.3	249.067
13	1482.3	249.115
14	1482.4	249.121
15	1482.5	249.119
16	1482.5	249.098
17	1482.4	249.948
18	1482.3	248.777
19	1482.4	248.593
20	1482.4	248.592
21	1482.4	248.479
22	1482.5	248.400
23	1482.2	248.573
24	1482.243	248.293
25	1482.100	248.463
26	1482.071	248.519
27	1481.911	248.288
28	1481.906	248.584
29	1481.727	248.557
30	1481.730	248.286
31	1481.784	249.050
32	1481.784	249.092

EXISTING EXTRACTION WELL COORDINATES

WELL DESIGNATION	NORTHING	EASTING
EX-1	1480.708	249.935
EX-2	1481.004	250.372
EX-3	1481.286	249.910
EX-4	1481.794	249.084
EX-5	1482.051	249.851
EX-6	1482.539	249.097
EX-7	1482.578	248.392
EX-8	1482.082	248.526
EX-9	1481.578	248.549

CONTRACTOR INSTALLED EXTRACTION WELL COORDINATES

WELL DESIGNATION	NORTHING	EASTING
EX-11	1481.743	248.275
EX-12	1481.923	248.278
EX-13	1482.263	248.383
EX-14	1482.459	248.475
EX-15	1482.429	248.392
EX-16	1482.429	248.779
EX-17	1482.502	248.935
EX-18	1480.512	249.910
EX-19	1481.297	249.955

DEMOLITION AREA

TVA BOUNDARY

NEW 3" PVC WATER SERVICE

CLEAN-OUT (CO-3C)

6" STEEL CASING

NEW FENCE

WTS BUILDING

NEW GATE

CONTRACTOR'S LAY DOWN AND TEMPORARY STORAGE AREA

STRIPPING MATERIAL AND TOPSOIL STOCKPILE AREA

ACTIVE SINKHOLE (APPROX 5'X7')

EX-19

EX-18

EX-2

EX-1

EX-3

EX-4

EX-5

EX-6

EX-7

EX-8

EX-9

EX-10

EX-11

EX-12

EX-13

EX-14

EX-15

EX-16

EX-17

EX-18

EX-19

EX-20

EX-21

EX-22

EX-23

EX-24

EX-25

EX-26

EX-27

EX-28

EX-29

EX-30

EX-31

EX-32

EX-33

EX-34

EX-35

EX-36

EX-37

EX-38

EX-39

EX-40

EX-41

EX-42

EX-43

EX-44

EX-45

EX-46

EX-47

EX-48

EX-49

EX-50

EX-51

EX-52

EX-53

EX-54

EX-55

EX-56

EX-57

EX-58

EX-59

EX-60

EX-61

EX-62

EX-63

EX-64

EX-65

EX-66

EX-67

EX-68

EX-69

EX-70

EX-71

EX-72

EX-73

EX-74

EX-75

EX-76

EX-77

EX-78

EX-79

EX-80

EX-81

EX-82

EX-83

EX-84

EX-85

EX-86

EX-87

EX-88

EX-89

EX-90

EX-91

EX-92

EX-93

EX-94

EX-95

EX-96

EX-97

EX-98

EX-99

EX-100

EX-101

EX-102

EX-103

EX-104

EX-105

EX-106

EX-107

EX-108

EX-109

EX-110

EX-111

EX-112

EX-113

EX-114

EX-115

EX-116

EX-117

EX-118

EX-119

EX-120

EX-121

EX-122

EX-123

EX-124

EX-125

EX-126

EX-127

EX-128

EX-129

EX-130

EX-131

EX-132

EX-133

EX-134

EX-135

EX-136

EX-137

EX-138

EX-139

EX-140

EX-141

EX-142

EX-143

EX-144

EX-145

EX-146

EX-147

EX-148

EX-149

EX-150

EX-151

EX-152

EX-153

EX-154

EX-155

EX-156

EX-157

EX-158

EX-159

EX-160

EX-161

EX-162

EX-163

EX-164

EX-165

EX-166

EX-167

EX-168

EX-169

EX-170

EX-171

EX-172

EX-173

EX-174

EX-175

EX-176

EX-177

EX-178

EX-179

EX-180

EX-181

EX-182

EX-183

EX-184

EX-185

EX-186

EX-187

EX-188

EX-189

EX-190

EX-191

EX-192

EX-193

EX-194

EX-195

EX-196

EX-197

EX-198

EX-199

EX-200

EX-201

EX-202

EX-203

EX-204

EX-205

EX-206

EX-207

EX-208

EX-209

EX-210

EX-211

EX-212

EX-213

EX-214

EX-215

EX-216

EX-217

EX-218

EX-219

EX-220

EX-221

EX-222

EX-223

EX-224

EX-225

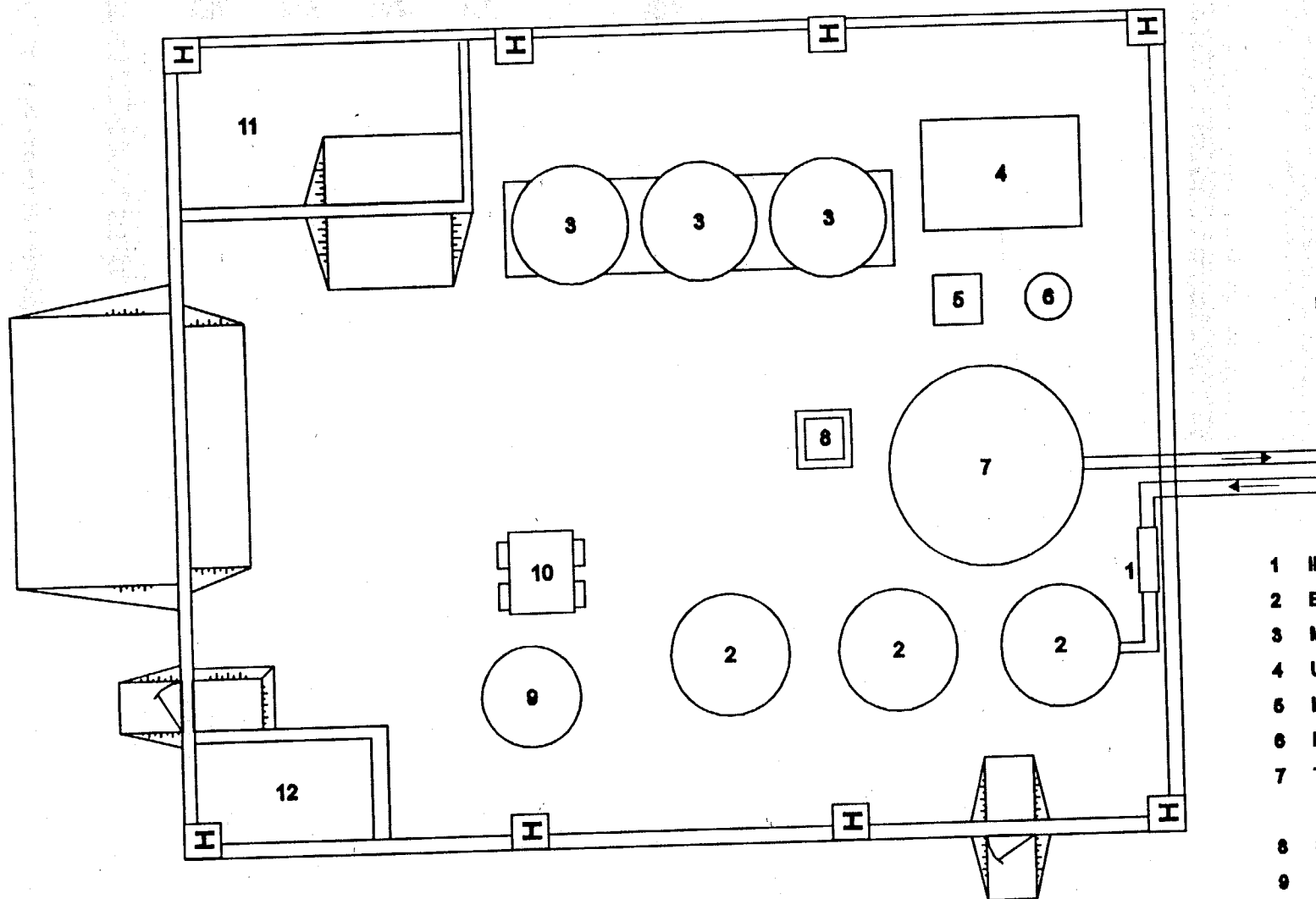
EX-226

EX-227

EX-228

EX-229





- 1 IN-LINE MIXER
- 2 EQUALIZATION TANKS
- 3 MULTI-MEDIA FILTER
- 4 UV/OXIDATION
- 5 H<sub>2</sub>O FEED UNIT
- 6 POLYMER FEED UNIT
- 7 TREATED EFFLUENT  
HOLDING TANK
- 8 SUMP/PUMP
- 9 BAG FILTERS
- 10 DUMPSTER
- 11 CHEMICAL STORAGE AREA
- 12 ELECTRICAL AREA

**WTS BUILDING EQUIPMENT LAYOUT PLAN (TYP)**

SCALE 1" = 10'

**FIGURE 3-1**